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FR/EN
WR NE, SD
MAILSTOP 60190

JAN 27 1986

MEMORANDUM

To: ARD-Wildlife Resources, Region 6
MAILSTOP 60130
Attn: Matthews

From: Regional Hydrologist, Engineering, Region 6

Subject: Annual Water Use Report/Management Plan

The subject report has been reviewed and found to be in order for the following stations:

Rainwater Basin WMD, NE
Lake Andes NWR/WMD, SD
Broken Arrow WPA, SD
Karl Mundt NWR, SD
Waubay NWR, SD

Please extend our thanks to station personnel for the timely submission of these reports.

ENG:GCHESY:JLR: 1/24/86
bcc: ENG RDG FL
CIRC FL
RD

ANNUAL WATER MANAGEMENT PROGRAM

Lake Andes National Wildlife Refuge, Lake Andes, SD

Water Unit: Lake Andes

I. Introduction

Lake Andes is a 4730 acre meandered lake whose water level depends entirely upon annual runoff. Two dikes cut the lake into three units, the North, Center, and South. Stop log water control structures are located within each dike, however, the lack of a permanent water supply precludes any water level manipulations.

Drainage area size and surface acres for each unit of Lake Andes are shown below. Maximum and average depth figures were determined in 1962, the last time the lake was completely full.

Unit	Drainage Area Acres		Surface Acres of Water	Water Capacity (Acre feet)	Depth when full Max.	Avg.
South	20,000	24%	1,760	16,159	13.5	11.5
Center	11,000	14%	2,359	18,000	14.5	12.9
North	53,000	62%	611	3,015	10.5	9.1
TOTAL	84,000	100%	4,730	37,174	-	-

In 1922, Congress passed a bill establishing a high water elevation of 1437.25 feet msl for Lake Andes via the construction of an artificial outlet on the South Unit. This level was established following local complaints about flooding around the lake. The Fish and Wildlife Service received the right to flood the meandered lake bed of Lake Andes in an easement taken in 1939 from the State of South Dakota.

II. 1985 Water Conditions

Water levels in Lake Andes slowly dropped throughout the year as evaporation took its toll on lake levels that had been the highest since 1962. A mild, open 1984-85 winter provided less than normal runoff. The North Unit, which has 62% of the drainage area, rose from a level of 1435.75 to 1436.86 by March 21. This was enough to overflow the stoplogs by a few inches, but ceased flowing by mid-April. Below normal precipitation in May and June did nothing to improve conditions. Water levels continued to fall until mid-August when above normal rainfall and cooler temperatures stabilized water levels nearly two feet below the outlet. An early freeze-up came on November 14 when a storm blew in, dropping 8" of snow. The upper layers of ice were clouded by snowfall. Up to 10" of snow covered the ice until mid-December.

1985 Lake Andes Water Levels - Feet MSL

Date	North Unit	Center Unit	South Unit
03/21	Ice Out		
03/21	1436.86	1435.50	1435.50
03/31	1436.70	1435.55	1435.55
04/16	1435.60	1435.60	1435.60
05/06	1436.58	1435.54	1435.54
05/30	1436.62	1435.42	1435.42
06/28	1436.06	1435.04	1435.04
07/30	1435.66	1434.60	1434.60
08/23	1435.65	1434.70	1434.70
09/03	1435.58	1434.60	1434.60
10/01	1435.50	1434.50	1434.50
10/30	1435.40	1434.40	1434.40
11/14	Freeze up		

III. Ecological Effects of Increased Water Levels In Lake Andes

The rapid increase in water levels that occurred in 1984 had lasting effects on Lake Andes wildlife and vegetation types.

Waterfowl breeding pairs totaled 638, down 38% from 1984 and 46% from 1983. The most noticeable change was the lack of nesting diver species, which dropped from 119 pairs in 1984 to 12 pairs in 1985 (mostly redheads). This was due to the lack of stands of emergent vegetation (primarily cattail stands), which were 70% drowned out in 1984 and continued to dieout in 1985. Lake Andes provided deep, open water habitat which was not optimum for puddle ducks nor did it provide emergent vegetation needed for diver nesting sites.

The production of submergent vegetation species increased as lake levels stabilized. Use days by wigeon, gadwalls, scaup, redheads, canvasbacks, and coots were higher during the fall migration than in 1984.

Seventy percent of the woody lake perimeter consisting of Russian olives/cottonwoods died after being flooded to a depth of 2-4 feet for two growing seasons.

The significantly deeper pool depths have provided excellent habitat for a developing Lake Andes fisheries. Populations of largemouth bass, yellow perch, and bluegills have flourished in the Center and South Units. Maximum depths of 8 feet in the South Unit and 7 feet in the Center Unit should provide enough depth to decrease the chance of winterkill during the winter of 1985-86.

IV. 1986 Water Management Objectives

Management objectives for 1986 are to contain as much runoff as possible in Lake Andes. It would require nearly 12,000 acre feet of water to reach the 1437.25 feet MSL established by Congress. At this level, water would be released from the outlet on the South Unit. This hasn't happened since 1962. Major flooding would be required to reach this level.

ANNUAL WATER MANAGEMENT PROGRAM

Lake Andes National Wildlife Refuge, Lake Andes, SD

Water Unit: Broken Arrow Waterfowl Production Area

I. Introduction

The Broken Arrow WPA is a 2650 acre tract in Douglas and Charles Mix Counties and was purchased in 1977. Two drainage systems existed on the property when purchased. The Mud Lake Drain has an upstream watershed of 25,600 acres, while the second system, the Joubert Drain, has a 12,320 acre watershed. Five ditch plugs or low head dams, with concrete stop log control structures, were installed in 1979 along the drainage ditches, two on the Mud Lake ditch and the remaining three on the Joubert drain. Dam #6 was constructed below dam #2 on the Mud Lake Drain in 1984. Design specifications for the six dams are as follows:

Embankment Volume YD^3	High Water Contour	Surface Acres	Acre-feet Impounded
Dam #1 - 76	497.6	6.2	5.7
Dam #2 - 755	497.6	27.9	82.6
Dam #3 - 2761	495.6	43.6	163.0
Dam #4 - 586	495.5	34.7	88.3
Dam #5 - 137	495.5	6.3	5.2
Dam #6 - 900		30.0	Not determined
	TOTAL	148.7	344.8

A water rights application was not filed with the State Water Rights Commission. Area office personnel at the time felt that since the project involved restoring drained wetlands a permit to impound water on this area was not required.

A new impoundment on the Joubert Drain will be constructed in 1986 in cooperation with Ducks Unlimited. The impoundment, at capacity, will have a full service area of 56.4 surface acres and store 131.2 acre feet of water. The development would increase the quantity of pair habitat by creating 5.9 miles of shoreline. The maximum depth will be 6.5 feet. The deep water areas will provide greater assurance of brood survival during periods of low precipitation when most of the shallow wetlands on Broken Arrow WPA may prematurely dry.

Ducks Unlimited, Inc. is under obligation for the project design and all construction costs. An application for a water right has been filed with the SD Department of Water and Natural Resources with the final hearing to be held on March 5, 1986.

II. 1985 Water Conditions

Although spring runoff was below normal, all impoundments were filled to capacity. Dam #6, which was constructed during the summer of 1984, failed to hold the rising waters and eroded along the drain pipe effectively draining the impoundment. Inadequate compaction was blamed. This dam was repaired during the summer and is ready to hold the 1986 spring runoff.

All impoundment water levels were reduced by summer evaporation. Both drains ceased flowing by mid-summer.

III. Ecological Effects of the Past Year's Water Levels on the Broken Arrow WPA

High impoundment levels resulted in good waterfowl habitat. Although covered with smartweed, no cattail stands have colonized the impoundments. Increased use by breeding pairs should be noticeable once additional vegetation types become established.

IV. 1986 Management Objectives

Water management plans for 1986 are to contain runoff to maximum designed elevations behind the six existing dams. For effective waterfowl production, the water level will be maintained at normal pool during nesting and brood rearing if possible.

ANNUAL WATER MANAGEMENT PROGRAM

Lake Andes National Wildlife Refuge, Lake Andes, SD

Water Unit: Owens Bay

I. Introduction

The Owens Bay Unit is a 240 acre marsh unit, separated by a dike from the South Unit of Lake Andes. A stop log water control structure is located in the dike to allow water releases into Lake Andes.

Owens Bay, in addition to water from natural runoff, is maintained by a free-flow artesian well. The well, drilled in 1957, originally had a 1000 gpm flow and water right. Well shutdowns during the 1973 DVE outbreak resulted in casing destruction and new casing had to be installed. The new casing reduced the well opening from 12" to 8" and dropped the flow to approximately 450 gpm where it is presently stabilized. The present well flow, without adequate spring runoff, is unable to maintain the entire marsh because of a 39 inch average annual evaporation rate.

A new 1000 gpm, 900+ foot deep, artesian well is presently being drilled near the existing well as a Ducks Unlimited cooperative project. To comply with the water right, the old well will be totally plugged when the new well begins producing. The new well should be operational in early 1986.

II. 1985 Water Conditions

A mild, open winter provided less than normal runoff although Owens Bay filled nearly to capacity. The artesian well remained open throughout the year flowing at a rate of approximately 450 gpm into the unit.

1985 Water Levels - Owens Bay

Date	Water Level
03/21	1442.08
05/06	1442.08
05/30	1441.94
06/28	1441.52
07/30	1441.02
08/28	1441.04
10/01	1441.02
10/30	1440.90
Pool Bottom	1436.52

III. Ecological Effects of the Past Year's Water Levels on Owens Bay

Stable water conditions existed through 1985. The number of waterfowl pairs increased to 160 from the 131 recorded in 1984. The brood habitat was good. An excellent interspersian of openings exists in the cattail stands which is due to a high muskrat population. Fall use by migrant waterfowl was high until freeze up.

IV. 1986 Water Management Objectives

Water management activities for 1986 are to contain as much runoff as possible in Owens Bay. The artesian well will continue to run at full flow in order to offset annual evaporation.

ANNUAL WATER MANAGEMENT PROGRAM

Lake Andes NWR Complex, Lake Andes, SD

Water Unit: Karl Mundt National Wildlife Refuge

The Karl Mundt NWR borders the Missouri River in Gregory County. The only water on the unit itself are four small (less than 1 acre) stock ponds that are used in conjunction with the grazing program. There is also a free-flowing artesian well that provides domestic water for the refuge quarters. Some of the flow from the well is diverted from the house to a small 1/2 acre pond to reduce water presure going to the house.

There presently is no active management of water on the Karl Mundt Refuge.